ANATOMY

OF THE

BRAIN AND SPINAL CHORD.

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SERIES OF ENGRAVINGS

INTENDED TO ILLUSTRATE

THE STRUCTURE

OF THE

BRAIN AND SPINAL CHORD

IN MAN.

BY

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PREFACE.

The parts of the body, with which the phenomena of Consciousness are immediately connected, consist of the Brain, the Medulla oblongata, the Spinal Marrow, and the Nerves.

The substance peculiar to the composition of these organs is a soft tenacious pulp, which has a white colour in some parts, while in others it presents different shades of grey and brown.

When white or grey nervous matter is diffused in a drop of water upon glass, and examined with a microscope, it appears broken down into sphericles of various sizes, the largest of which are individually smaller than globules of the blood.

The material, which has been described, is wrought up with a variable proportion of membrane: where the latter is abundant, as in the nerves, the part possesses considerable firmness, and displays in the recent state a regular structure.

The Spinal Marrow is a flattened chord, from five to eight lines in thickness, contained in the vertebral canal, and terminating in a point at the upper part of the lumbar region; the opposite extremity upon entering the foramen magnum of the os occipitis enlarges into a cone, upon which are placed hemispherical masses of nervous substance. The cone is the Medulla oblongata; the hemispherical masses are the Cerebrum and Cerebellum.

The nervous matter, which forms the outward crust of the Spinal Marrow and Medulla oblongata, the Pedicles and Commissures of the Brain, and the internal substance of the Hemispheres, is white: that, which occupies the surface of the Cerebrum and Cerebellum, and forms the axis of either half of the Spinal Marrow and Medulla oblongata, is grey or brown.

The transition from the white colour to grey is in almost every instance abrupt.

The Nerves are forty pairs of flattened chords, which extend from the spinal marrow and medulla oblongata to the sentient and irritable parts of the body.

The attachment of a nerve to the spinal marrow or medulla oblongata is termed its root or origin; the opposite extremity, its termination.

Some of the sentient nerves appear to terminate on surfaces. The only nerve, which ends in an expansion sufficiently large for satisfactory examination, terminates by a thin layer of grey matter. All the nerves rise in part at least from grey matter.

A Nerve has a glistening silvery surface, which belongs to the dense external membrane, that it seems to borrow from the dura mater. Upon removing this outer tunic, a nerve is found to consist of white fibrils, which are disposed parallel to each other, but coalesce reciprocally by branches, that are more or less oblique in different instances. Each fibril is invested with a fine vascular membrane, termed the neurilema, which connects it to those adjoining, and penetrates throughout its substance. The fibrils of nerves are composed of innumerable filaments, which appear to be strings of cohering sphericles of nervous matter.

When nerves are protected by their position, their texture contains but little membrane. The first nerve in the cranial cavity, and the second nerve near its origin, may serve to illustrate this remark. In these instances, a fibrous structure is with difficulty detected in the nerve, when recent. But if the softest nerve be macerated for a few weeks in alcohol, by degrees it becomes consistent, and at length admits of being readily torn into longitudinal threads.

The texture of the Brain and Spinal Marrow likewise contains but little membrane.

If a fresh Brain be placed in water, and the pia mater be carefully removed from its surface, the nervous substance is found to have the consistence of dough, and exhibits when divided no appearance of definite structure, except what arises from the alternation of different colours.

Nevertheless in parts the white matter appears shaped into chords, which have a great resemblance to the softer nerves: such, for instance,

is the appearance of the anterior Commissure in the Cerebrum, of the Fornix, and of the anterior Pyramids at their origin.

If the Brain and Spinal Marrow be macerated for several months in spirits of wine, their substance shrinks, and at the same time acquires consistence. The parts, which when fresh exhibit a superficial resemblance to nerves, may when slightly hardened be traced into the adjacent substance, as separable chords, and tear into filaments resembling those of nerves. After a period, which varies from six to eighteen months, all the white matter assumes a fibrous character; and that, which seemed at first an uniform pulp, now appears wholly composed of threads arranged in the most intricate and curious order.

That the structure thus displayed, is the genuine structure of the Brain, appears probable upon the preceding statement alone, and may be easily demonstrated in the following manner. If two brains be macerated in alcohol, the one entire, the other previously cut into pieces, the corresponding parts in either specimen are found to tear exactly alike. A different result would ensue, if the brain possessed no definite structure antecedently to the hardening process.

Now it has been ascertained in regard to the Nerves, that the filaments, of which *they* consist, have the office of conductors, or are employed to transmit an influence either from their origin to the part in which they terminate, or the reverse. We may therefore infer by analogy that the white threads, resembling filaments of nerves, which enter so largely into the composition of the Spinal Marrow, the Medulla oblongata, and the Brain, serve likewise as media for conveying impressions from one part of these organs to another. The justness of this conclusion in the instance of the Spinal Marrow has been proved by experiments made on animals.

Thus a new source of interest attaches to the morbid anatomy of the Brain;—an apoplectic effusion, an abscess, a partial change of structure in the Brain, are to be viewed not only as producing a direct loss of cerebral substance, but as destroying additionally the connexion between other parts more or less remotely situated, to the interruption or impairment of their functions. Dr. Hooper's splendid fasciculus on the morbid anatomy of the brain, shows how much may be done with the assistance of the rude Anatomy, which alone has hitherto been taught. And results even more important may be expected, when similar researches are conducted with that precision, which necessarily follows upon a more exact and refined knowledge of natural structure.

The method of displaying the structure of the Brain, by hardening it in alcohol, and observing in what manner the coagulated substance tears, was first employed successfully by the late Professor Reil, who published an account of his researches, accompanied with figures, in the Archiven für die Physiologie, a periodical work edited conjointly by himself and Autenrieth. The figures, indeed, adjoined to the essays of Reil are rather plans than drawings: yet imperfect as they are, the readiest means of verifying the descriptions contained in the text, are found to consist in fashioning the hardened brain so as to resemble the figures, and subsequently comparing the dissection with the preliminary statements.

In the hope of facilitating the studies of others, I have attempted to execute a series of drawings having a greater resemblance to the objects, they are intended to represent, than those of Reil; and which exhibit the anatomy of the Spinal Marrow, and Medulla oblongata, in connexion with that of the Brain.

For the accuracy of these delineations I am myself responsible, having drawn the outline of each from the best of many specimens, which I prepared. It may serve to attest their correctness, that they were shaded by another hand. I left the greater part of this task to my young friend Mr. Rowlands, who assisted me in the previous dissection, knowing that he possessed more skill as an artist, than I have attained.

George-street, Hanover-square,
March 1, 1827.

PLATE I.

In this plate are shown, the structure of the Spinal Marrow, the origin of the anterior Pyramids, and of the fasciculi which join the latter in their passage through the Pons Varolii.

FIG. I.

Represents the anterior surface of the lower portion of the Spinal Marrow. The cut extremity is supposed to be bent forwards, so as to exhibit the appearance of a transverse section.

a. The anterior median furrow, which extends nearly half way through the substance of the spinal marrow. At the bottom of this furrow there is a narrow plate of white substance, which is perforated by numerous apertures for the transmission of blood-vessels.

b. The posterior median furrow; a shallow line, such as might be traced with the point of a needle. At this furrow, the spinal marrow readily tears open in the median plane; the rent extends to the grey matter: the disunited surfaces seem to have been joined by membrane only.

c c. The anterior lateral furrows; shallow broken lines, at which the anterior filaments of the spinal nerves are attached.

d d. The posterior lateral furrows, more deeply indented than either the posterior median, or the anterior lateral furrows. At these furrows the filaments, which form the posterior roots of the spinal nerves, are attached.

At either posterior lateral furrow, the spinal marrow readily tears open; the rent extending in the direction shown in the figure.

e e. Grey matter in the axis of either half of the spinal marrow, forming a pentagonal figure: an isthmus extends across, which joins the two lateral portions. The posterior corner of each portion of grey matter extends towards the posterior lateral furrow.

FIG. II.

Represents the posterior surface of a portion of the Spinal Marrow, taken from the upper part of the back.

a, *b*, *c*, *d*, *e*. The same as in Fig. I.

*b*1. The posterior median furrow rent open.

*d*1. The posterior lateral furrow of the right side rent open.

f f. A shallow furrow on each side of the posterior median, which vanishes towards the lower part of the spinal marrow; and is continuous above with the furrow upon the medulla oblongata, that separates the posterior pyramid from the corpus restiforme.

Fig. III.

Represents the anterior surface of the adjoining portions of the Spinal Marrow and Medulla oblongata.

A. Spinal Marrow.

B. Medulla oblongata.

a, b, c, d, e. The same as in Figs. I. and II.

g. A portion of the spinal marrow, rent open from the bottom of the anterior median furrow. It consists of white fibrils, disposed parallel to the axis of the spinal marrow, continually interlacing by means of filaments, that cross obliquely from each fibril to those adjoining.

h. At this point, the adhesion of the fibrils of the rent half of the spinal marrow to the substance at the floor of the anterior median furrow, is left. The substance forming this adhesion, when drawn out, has the appearance of a fine net-work. The grey matter in the spinal marrow appears rather to tear with the adjacent white fibrils, than to possess itself a fibrous structure.

i. Narrow flat bands of white nervous matter, which ascend obliquely from the axis of one side of the spinal marrow to the opposite side of the medulla oblongata.

k. Curvilinear fibres, which extend forwards from the back part, and from the side of the medulla oblongata to its anterior surface.

l l. The anterior pyramids, with which the fasciculi *i* and *k*, as well as the fibrils belonging to the anterior surface of the spinal marrow are continuous.

m m. The olivary bodies.

n n. The restiform bodies, or inferior pedicles of the cerebellum.

o. The anterior median furrow of the medulla oblongata, resembling the anterior median furrow of the spinal marrow.

Fig. IV.

Represents the anterior surface of the Spinal Marrow, Medulla oblongata, and Pons Varolii, as seen obliquely from the right side.

A, B, *a*, *b*, *m*. The same as in Fig. III.

C. The left half of the pons Varolii, the right having been removed after a section in the median plane.

l. Left anterior pyramid.

*l*1. Right anterior pyramid, represented as cut through near the margin of the pons Varolii, and reflected from the subjacent layer, so as to show more distinctly the decussation of its inner fasciculi, with those of the opposite pyramid.

The anterior pyramid consists of white fibrils disposed longitudinally, and joined together by delicate filaments, which are reciprocally interchanged.

p. Lateral part of the spinal marrow rent back after its division at *q*.

r. Axis of the right half of the spinal marrow, with which the inner fasciculi of the left anterior pyramid are continuous.

s. Appearance produced by rending open the medulla oblongata from the anterior median furrow, in the median plane.

t. Section of the pons Varolii in the median plane.

u. Fasciculi, which lie behind the anterior pyramid.

w. Continuation of the same fasciculi behind the pons Varolii.

Fig. V.

Represents one half of the Pons Varolii, with the anterior pyramid attached to its lower margin, and a portion of the crus cerebri left at its upper edge.

The superficial layer of the pons Varolii consists of transverse white fibrils, which unite the two hemispheres of the cerebellum. Upon pressing the handle of a scalpel against the pons, where the crus cerebri enters it, the superficial layer of fibrils is readily detached; and the thick white fasciculi, of which the outer part of the crus cerebri consists, are traced in their passage through the pons, decussating its transverse fibres. Some of the fasciculi of the crus cerebri emerge at the posterior edge of the pons, and form the anterior pyramid. The others terminate by fine filaments in the substance of the pons itself, apparently in the grey matter, which it contains.

C, *l*, *i*, *k*, *l*. The same as in Fig. IV.

D. Portion of the crus cerebri.

j. Fibrils, which the anterior pyramid derives from the anterior surface of the spinal marrow.

*x*1. Superficial layer of transverse white fibres in the pons Varolii, represented as raised and turned aside.

*x*2. Transverse fibres exposed upon reflecting *x*1.

y. Fibrils, which rise in the substance of the pons Varolii, and join the crus cerebri.

z. A fasciculus derived from the olivary body, which ascends behind the pons to attach itself to the inner margin of the crus cerebri.

PLATE II.

The Figures in this plate are taken from sections of recent parts, and are intended to show the alternations of colour in the Medulla oblongata and Pons Varolii.

Fig. I.

Represents the anterior surface of a Pons Varolii and Medulla oblongata, of which the next three figures are transverse sections.

B. Medulla oblongata.

C. Pons Varolii.

a. Anterior pyramid.

b. Olivary body.

c. Inferior pedicle of the cerebellum.

Fig. II.

Represents a section through the lower part of the Medulla oblongata.

d. Section of the decussating fibres of the anterior pyramids.

The grey matter in the axis of either half of the medulla oblongata expands to form an imperfect capsule containing white matter, both at the fore and outer part, and towards the back part. This appearance is represented at *e*, and *f*.

Fig. III.

Represents a transverse section of the Medulla oblongata in the line B B.

g g. Grey matter contained in the olivary bodies, forming an irregularly folded capsule, open at its inner and back part.

Fig. IV.

Represents a transverse section of the Pons Varolii and Medulla oblongata at the line C C Fig. 1. The alternate layers of white and grey matter were copied by means of tracing paper applied to the section itself. At the fore part of the figure is the intermixture of transverse and longitudinal white fibres with interstitial grey matter belonging to the pons Varolii.

h h. Section of the upper pedicle of the cerebellum, or pillar of the valve of Vieussens.

i i. Section of the fillet of the medulla oblongata.

k. Section of the iter a tertio ad quartum ventriculum.

FIG. V.

Represents the surface of a longitudinal section made obliquely through the Pons Varolii and Medulla oblongata.

a. Anterior pyramid.

b. Olivary body.

g. Folded capsule of grey matter in the olivary body.

l l. Longitudinal fasciculi in the pons Varolii extending from the anterior pyramid to the crus cerebri.

m m. Superficial layer of transverse white fibres.

FIG. VI.

Represents an oblique section of an hemisphere of the cerebellum, carried obliquely downward, backward, and inward, from the attachment of the upper pedicle; in order to display the folded grey matter in the arbor vitæ.

C. Pons Varolii.

H. Left hemisphere of the cerebellum.

h h. Superior pedicles of the cerebellum.

n. Section of the folded capsule of grey matter, which is open anteriorly and inwardly.

o. White matter contained within *n*.

FIG. VII.

Represents a section of the pes hippocampi, intended to show the disposition of its white and grey matter.

p. Pes hippocampi.

q. Tænia hippocampi.

r. A line at which the adjoining layers do not adhere, but are merely in apposition, forming a kind of ventricle.

FIG. VIII.

The same surface represented with the ventricle drawn open; the parts are lettered as in the preceding figure.

PLATE III.

Represents the left hemisphere of the Cerebrum and of the Cerebellum, with substance enough rent away from each to show its superficial structure.

A. Anterior lobe of the cerebrum.
B. Middle lobe.
C. Posterior lobe.
D. Crus cerebri.
F Tubercula quadrigemina.
G. Pons Varolii.
H. Left hemisphere of the cerebellum.
K. Medulla oblongata.
L. Spinal Marrow.

In preparing for the present dissection, the brain should be divided by an incision in the median plane. The parts to be displayed in the cerebrum are situated at the bottom of the fissure of Sylvius; and in order that they may be fully exposed, the two extremities of the hemisphere require to be bent inwards.

When the fissure of Sylvius is spread open, an oval group of low convolutions is seen, intervening between the middle and anterior lobes of the brain: these are to be scraped away, or rather broken off, by pressure with the handle of a scalpel.

The next step consists in splitting with the same instrument the convolutions, which form the margin of the fissure of Sylvius. After a few trials, the rent from one convolution will be found to run across from its base to a neighbouring convolution in a direction parallel to the surface of the hemisphere, and the greater part of the appearances delineated in this plate will be readily produced.

a. Layer of grey matter forming the crust of the convolutions of the brain: it assumes a less distinctly fibrous structure than the white matter, but often tears as if disposed in filaments vertical to the surface.

b. Fibres of white substance, or plates resoluble into fibres, reflected from the grey matter of one convolution, to the grey matter of the next adjoining. These form great part of the white matter contained in each convolution.

c. Fibres of white substance, or plates resoluble into fibres, which connect the grey matter of remote convolutions of the same hemisphere.

d. Other fibres of a similar description, which extend below the group of low convolutions already described from the convolutions of the anterior to those of the middle lobe. On cutting these through, and partially removing them,

e. The outer portion of the striated body, is exposed.

The structure of the outer portion of the striated body appears to be granular: its colour is grey; but from it white fibres distinctly arise, which extend towards the convolutions of the upper part of the brain.

f. White fibres rising out of the striated body.

g. Section of fibres that belonged to a split convolution, and are derived in part from the great commissure of the brain.

The adjoined view of the superficial structure of the cerebellum is prepared without difficulty.

The transverse fibres of the pons Varolii extend into either hemisphere of the cerebellum under the name of its middle pedicles.

Let the laminæ of the upper part of the cerebellum be pressed off with the handle of a scalpel from the middle pedicle; let the rent be carried to the posterior margin of the cerebellum; and subsequently be prolonged inwards towards the upper vermiform process. Near the edge of the upper vermiform process and in a line parallel to the median plane, the raised portion of the cerebellum is to be abruptly torn off. The surface exposed will present appearances like those delineated.

The arborescent substance of the cerebellum is crusted with an equable layer of grey matter, like the cerebrum. The white substance within consists of plates, resoluble into fibres, disposed upon a plan exactly resembling that followed in the construction of the cerebrum.

h. Fibres reflected from one lamina to that adjoining, analogous to *b*.

i. Fibres connecting the grey matter of remote laminæ, analogous to *c*.

k. Fibres derived from the pons Varolii, analogous to *a* and *c* [Plate VI.], spreading towards every point of the circumference of the hemisphere, and extending to the grey matter upon the surface.

l. A process of the cerebellum, termed the flock.

m. Middle pedicle of the cerebellum.

n. Upper pedicle.

o. Lower pedicle or corpus restiforme.

p. Olivary body.

q. Anterior pyramid.

r. Curvilinear fasciculi derived from the side of the medulla oblongata to the anterior pyramid.

s. Posterior pyramid.

PLATE IV.

The white fibres in the brain are disposed in three series.

The first unite adjoining or remote convolutions, or laminæ, of the same hemisphere.

The second unite the convolutions or laminæ of different hemispheres.

Fibres of the third kind extend, either from the medulla oblongata to the cerebrum and cerebellum; or from the cerebellum to the cerebrum; or from the tubercular parts situated upon the medulla oblongata to the cerebrum.

Plate III. exhibits fibres of the first description in the cerebrum; and of the first and second kind, in the cerebellum.

The present plate represents the third order of fasciculi principally.

A. Anterior lobe of the cerebrum.

B. Middle lobe.

C. Posterior lobe.

D. Crus cerebri.

E. Thalamus nervi optici.

F. Tubercula quadrigemina.

G. Pons Varolii, cut through on the left of the median plane.

I. Upper vermiform process.

K. Medulla oblongata.

L. Spinal marrow.

After the preceding dissection has been made, the present view is easily prepared upon the same brain.

With the handle of a scalpel, the fibres of the middle pedicle of the cerebellum are to be raised from the inferior pedicle, and to be divided in such a manner as to expose the prolongation of the inferior pedicle into the substance of the cerebellum.

a. Inferior pedicle of the cerebellum, or corpus restiforme.

b. Continuation of the inferior pedicle into the substance of the cerebellum.

c. Fibres of the same extending towards the circumference of the hemisphere.

d. Fibres extending from the inferior pedicle into the vermiform process.

e. Under surface of laminæ belonging to the vermiform process, showing the white fibres reflected from each lamina to that adjoining.

f. Section of the left hemisphere of the cerebellum parallel to the median plane, showing another view of the capsule of grey matter.

g. Upper pedicle of the cerebellum.

The threads, of which the upper pedicle of the cerebellum is composed, are finer than those of the lower pedicle. It has been seen, that the three pedicles enter each hemisphere in the following order. To the outside the middle pedicle, next to this the lower, and to the inside the upper. The white matter, which the capsule of grey matter contains, is derived from the upper pedicle.

The next step consists in following the anterior pyramid towards the cerebrum.

With this object in view the pons Varolii is to be detached from the medulla oblongata; the natural division between these parts being ascertained, by pursuing the line of separation, already found, between the middle and inferior pedicles of the cerebellum.

It may be convenient at this period of the dissection to remove some part of the pons Varolii; by which means the continuity of the anterior pyramid with the crus cerebri is additionally shown.

h. The anterior pyramid.

i. Fibres of the anterior pyramid ascending through the pons Varolii.

k. A fasciculus derived from the corpus olivare, which attaches itself to the under surface of the crus cerebri. [*d*. Plate V.]

The handle of a scalpel, laid flat upon the crus cerebri, is now to be employed in pressing aside the tractus opticus and outer portion of the corpus striatum; so as to display the divergence of the fasciculi of the crus cerebri towards the general circumference of the brain.

l. Fasciculi derived from the crust, or outer and inferior stratum of the crus cerebri, spreading towards the circumference of the hemisphere.

m. Fibres derived from the thalamus, which are associated with the preceding.

n. Oblique section of fibres, proceeding from the thalamus to the lateral and under parts of the middle and posterior lobes of the brain.

o. Region in which the divergent fibres already described decussate those derived from the great commissure of the cerebrum: towards the posterior lobe a similar appearance is not found: the dissection is here more superficial, and the fibres derived from the great commissure bear a smaller proportion to the radiating fibres of the crus cerebri.

p. Fibres, or plates resoluble into fibres, which in part are of the class used to unite convolutions of the same hemisphere, in part are derived from the great commissure. The ultimate filaments, that from the three sources already pointed out extend to the grey matter of each convolution, appear to decussate each other in the substance of the convolutions.

q. Grey matter of the convolutions.

r. Section of the striated body.

s. Section of the anterior commissure.

t. Section of the hippocampus major.

To complete the present dissection, the pons Varolii is to be pressed forward; the inferior pedicle of the cerebellum to be pressed downward and backward; and the handle of a scalpel, laid flat upon the upper pedicle, to be carried forwards and upwards towards the cerebrum, in order to detach from the upper pedicle the layer of oblique fasciculi, which crosses over it at its entrance into the crus cerebri.

α. Olivary body.

β. Fibres of the medulla oblongata that lie behind the anterior pyramid and the central part of the pons Varolii.

γ. Fasciculi derived from the olivary bodies, the superficial layer of which is distributed in the same manner as the fasciculi ε and ζ, that cover it.

δ. Remaining fasciculi of the medulla oblongata, which ascend towards the cerebrum.

ε. Fillet of the medulla oblongata, consisting of fasciculi, which emerge from the upper surface of the pons Varolii, and are in part of a commissural nature, coalescing with their fellows beneath the tubercula quadrigemina.

ζ. Part of the fillet, the fasciculi of which ascend in the crus cerebri above or behind its crust, and are blended with dark grey or black filaments.

η. Fibres derived from the grey matter of the corpus bigeminum inferius, or lowermost of the tubercula quadrigemina, which associate themselves with the crus cerebri.

θ. Fibres from the corpus bigeminum superius.

ι. Corpus geniculatum internum.

κ. Corpus geniculatum externum.

PLATE V.

Represents the inner surface of the Medulla oblongata and of the left half of the Brain, after a section in the median plane.

A. Anterior lobe of the cerebrum.

B. Middle lobe.

C. Posterior lobe.

D. Crus cerebri.

E. Thalamus nervi optici.

F. Tubercula quadrigemina.

G. Pons Varolii.

H. Part of the left hemisphere of the cerebellum.

I. Section of the superior vermiform process.

K. Medulla oblongata.

M. Corpus callosum.

N. Fornix.

N_1. Posterior crus of the fornix.

N_2. Anterior crus of the fornix.

a. Anterior pyramid, entering the pons Varolii.

b. Coarse white fasciculi derived from the anterior pyramid and pons Varolii, which form the crust or superficial stratum of the crus cerebri.

c. Olivary body; the capsule of grey matter in which is filled with white fasciculi, that tear horizontally in the manner delineated.

d. An accessory fasciculus derived from the olivary body, which joins the crust of the crus cerebri.

e. Substance behind the olivary body, which tears into longitudinal filaments.

f. Posterior pyramid, composed of white filaments, and terminating in the longitudinal fibrils of light grey matter, which form the floor of the fourth ventricle.

g. Inferior pedicle of the cerebellum.

h. Superior pedicle of the cerebellum.

i. Structure of the central and upper part of the medulla oblongata, which consists of horizontal plates of grey matter.

k. Structure of the thalamus, which consists of concentric plates of grey substance.

l. Origin of the anterior crus of the fornix among the concentric plates of the thalamus.

m. Divergent fibres derived from the upper and internal part of the medulla oblongata or crus cerebri, which slant abruptly outward, and afterwards join the fasciculi derived from the anterior pyramid, the thalamus, and the striated body.

n. Section of the anterior commissure.

o. Corpus albicans, a nodule formed by the abrupt flexion of the anterior crus of the fornix upon the base of the brain.

p. Fissure between the middle and posterior lobes of the cerebrum.

PLATE VI.

Represents the distribution of fasciculi, which extend across from one hemisphere of the Cerebrum to the opposite, forming commissures that are analogous to the pons Varolii in the Cerebellum.

In preparing the brain for the present object, it is necessary to remove the cerebellum by dividing the crura cerebri at the margin of the pons Varolii, and to separate the hemispheres of the cerebrum by a section in the median plane. The brain is rendered pliant, by removing the lateral part to the same extent as in Plate III.

The dissection may then be accomplished in the following manner. The handle of a knife is to be introduced into the posterior horn of the lateral ventricle, so as to serve as a director in dividing longitudinally the inferior convolutions of the posterior lobe of the brain. Afterwards, the under and outer part of the posterior and middle lobes, including the hippocampus major, may be rent away; by which means the upper surface of the inferior and posterior horns of the lateral ventricle is exposed.

It remains to trace the anterior crus of the fornix into the thalamus; and to pursue the course of the anterior commissure through the striated body, to its expansion in the inferior convolutions of the middle lobe of the cerebrum. Finally the convolutions situated along the upper surface of the great commissure are to be rent off.

A. Anterior lobe of the cerebrum.
B. Middle lobe.
C. Posterior lobe.
D. Crus cerebri.
E. Thalamus nervi optici.
F. Tubercula quadrigemina.
M. Great commissure of the cerebrum.
N. Fornix.
N1. Posterior crus of the fornix.
N2. Anterior crus.
O. Corpus albicans.
P. Anterior commissure.
R. Optic nerve.
S. Corpus geniculatum externum.
T. Corpus geniculatum internum.

X. Fillet of the great commissure, a narrow longitudinal band, interposed between that substance and the adjacent convolutions. The fillet consists of white fibrils, which communicate reciprocally by threads passing from one to another, and serve to unite the extreme and intermediate convolutions, which rest upon the margin of the great commissure.

a. Fibres derived from the fillet and from the great commissure to the convolutions of the brain.

b. Section of the posterior crus of the fornix, and of fasciculi derived from the great commissure to form the floor of the inferior horn of the lateral ventricle.

c. Fibres from the great commissure diverging towards the circumference of the hemisphere: to render these distinct where they form the roof of the lateral ventricle, a thin superficial layer of membrane and adherent nervous matter requires to be scraped away.

d. Expansion of the fibres, of which the anterior commissure is formed, in the anterior and inferior convolutions of the middle lobe of the cerebrum.

e. Fasciculi reflected from the convolutions of the middle lobe of the brain to those of the anterior lobe, the same as *d*, Plate III.

f. Fibres, which unite adjoining convolutions.

g. Superficial concentric plates of the thalamus partially removed, to show,

h. The origin of the anterior crus of the fornix in the thalamus, near its upper surface.

i. Semicircular fibres, to which the tractus opticus adheres.

l. Crust or superficial part of the crus cerebri, consisting of coarse white fasciculi, derived from the anterior pyramid and from the pons Varolii.

m. Black matter disposed in fibres parallel to the axis of the crus cerebri.

n. Remaining substance of the crus cerebri, the nature of which has been already elucidated.

o. Fibres derived from the crus cerebri, exposed by the removal of the under part of the corpus striatum, in their course towards the convolutions of the anterior lobe of the cerebrum.

p. Fibres derived from the same source, exposed by pressing aside the fasciculi of the great commissure from the thalamus, and from the fasciculi which are derived from it to form part of the roof of the inferior horn of the lateral ventricle.

PLATE VII.

The Figures in this plate show the origin of all the cerebral Nerves, and of the posterior fasciculi of the spinal Nerves.

Fig. I.

Represents the origin of the first or olfactory nerve by several filaments from the under surface of the striated body.

A. Anterior lobe of the brain.
B. Striated body.
a. Cribriform plate of the brain.
b. Section of the anterior commissure.
c. Fibres corresponding to *e*, Plate VI. and *d*, Plate III.
I. Olfactory nerve.

Fig. II.

Represents the origin of the eight lower cerebral nerves upon the left side.

D. Crus cerebri.
E. Thalamus nervi optici.
F. Tubercula quadrigemina.
G. Pons Varolii.
L. Spinal Marrow.
S. Corpus geniculatum externum.
T. Corpus geniculatum internum.
a. Section of the outer layer of fasciculi belonging to the crus cerebri.
b. Black substance in the crus cerebri.
c. Upper pedicle of the cerebellum.
d. Fillet of the medulla oblongata.
e. Inner and posterior portion of the medulla oblongata.
f. Anterior pyramid.
g. Olivary body.
h. Inferior pedicle of the cerebellum.
II. Second or optic nerve, rising from the thalamus and corpora geniculata.
III. Third nerve, rising by many filaments from the black substance in the crus cerebri.

IV. Fourth nerve, rising by three or four fasciculi from the upper pedicle of the cerebellum.

V. Fifth nerve, consisting of a smaller anterior and a large posterior portion. The fasciculi belonging to each pass between the transverse fibres of the pons Varolii to the back part of the medulla oblongata.

VI. Sixth nerve, consisting of two fasciculi, both of which are seemingly attached at the posterior margin of the pons Varolii and outer edge of the anterior pyramid, but pass behind the former to the grey matter at the back part of the medulla oblongata.

VII1. Facial nerve, or hard portion of the seventh, rising by two or three large fasciculi from the back part of the medulla oblongata.

VII2. Auditory nerve, or soft portion of the seventh, rising by an anterior fasciculus immediately below the facial nerve, and taking a second origin delineated in the next Figure at the calamus scriptorius; this nerve has a gangliform enlargement where it turns round the crus cerebri.

VIII. The eighth nerve consists of the glosso-pharyngeal, the pneumo-gastric, and the spinal accessory.

VIII1. Glosso-pharyngeal nerve and the pneumo-gastric or nervus vagus rise by numerous filaments from the fore part of the inferior pedicle of the cerebellum, into the substance of which they may be traced, and followed through it to the grey matter at the back of the medulla oblongata. The uppermost fasciculi constitute the glosso-pharyngeal nerve.

VIII2. Spinal accessory nerve, rising by many filaments from the lateral and posterior surface of the spinal marrow, in the upper part of the neck; these filaments are attached near to the posterior roots of the spinal nerves.

IX. Ninth nerve, or muscular nerve of the tongue, consisting of two portions, which rise by many slender fasciculi from the anterior surface of the olivary body, and the fore part of the medulla oblongata, immediately below it. Some of these fasciculi penetrate to the grey capsule in the olivary body.

Fig. III.

Represents the structure of the commissure of the tractus optici.

a a. Tractus optici.

b b. Optic nerves.

c. Commissura tractuum opticorum.

d. Epithelion, or superficial layer of membrane and adherent nervous matter.

e. Fibres, reflected from one optic nerve to the opposite.

f. Fibres, reflected from one tractus opticus to the opposite.

g g. Outermost fibres of one tractus, which are continuous with the optic nerve of the same side.

h. Fibres which pass obliquely across from one tractus opticus to the optic nerve of the opposite side.

Fig. IV.

Represents the posterior origin of the soft portion of the seventh nerve.

V. Pineal gland.

a a. Pedicles of the pineal gland.

b. Substance of one of the corpora bigemina inferiora, which seems to consist of grey matter without any very definite structure.

c. Fillet of the medulla oblongata.

d d. Upper pedicles of the cerebellum.

e. Section of the valve of Vieussens on one side of the median plane. This part consists of four or five pairs of laminæ, of an identical nature with those of the cerebellum, disposed on either side of a median furrow: the valve of Vieussens is therefore a simple production of the superior vermiform process.

f. Inferior pedicle of the cerebellum.

g g. Posterior pyramids.

h. Decussation of the inner fasciculi of the anterior pyramids.

VII2. The auditory nerve, of which the posterior origin is seen upon the floor of the fourth ventricle, to take place by two sets of fasciculi.

i. Fasciculi, which rise from the grey matter at a little distance from the median furrow.

k. Fasciculi, which extend to the median furrow, and apparently coalesce.

Fig. V.

Represents the origin of the posterior fasciculi of the spinal nerves.

a. Upon the right side the posterior fasciculi are shown to be continuous with the inner and posterior column of white matter belonging to the spinal chord.

b. Upon the left side, the spinal chord is represented as rent open at the posterior lateral furrow, displaying fasciculi from the spinal nerves rising out of the central grey matter.

The anterior fasciculi appear to rise in the same manner as the posterior, partly from the white substance of the spinal marrow, partly from the grey.

THE END.

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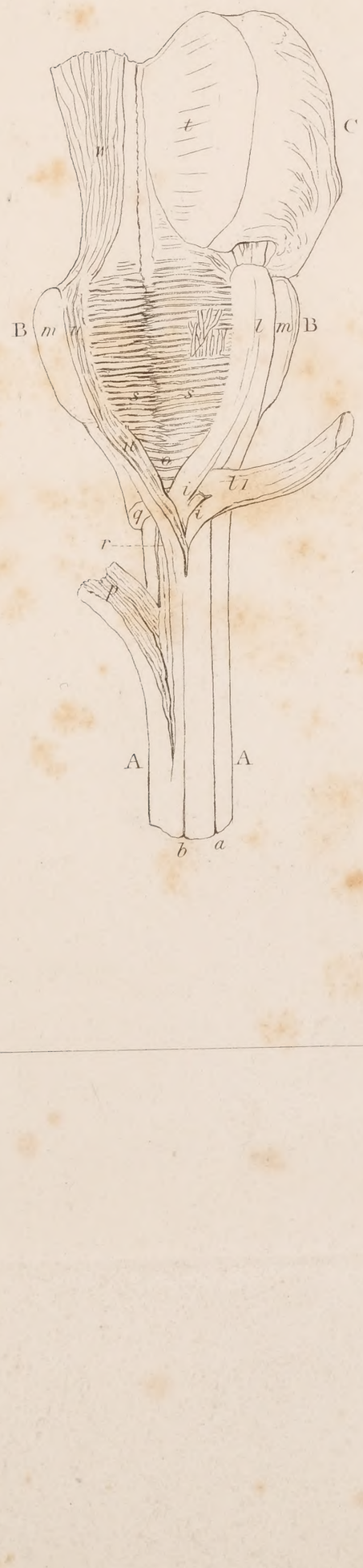
PLATE I.

I

II

III

IV



V

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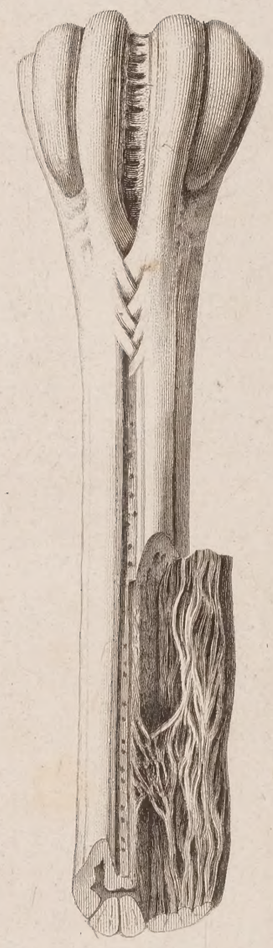
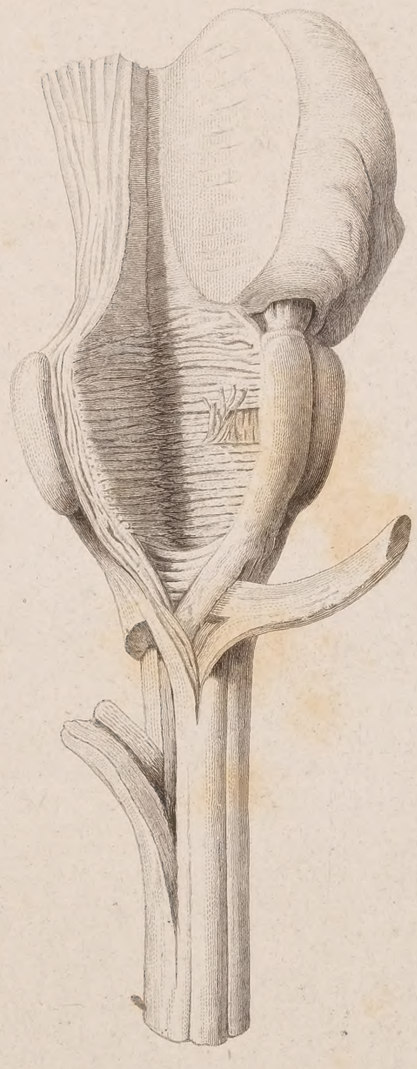
PLATE I.





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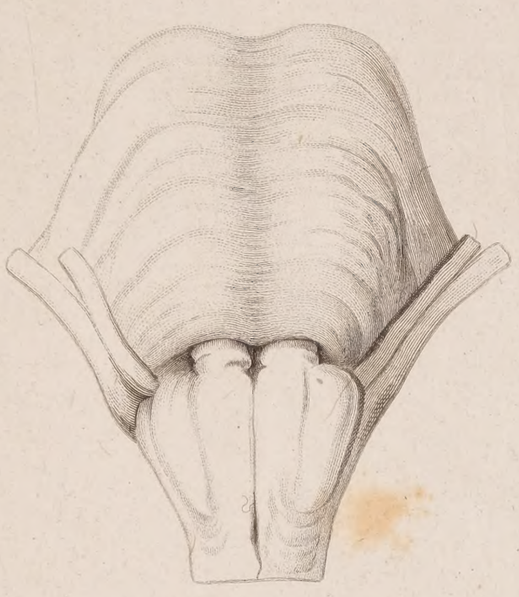

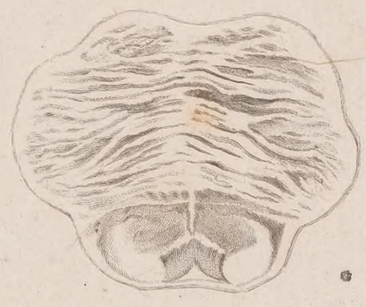

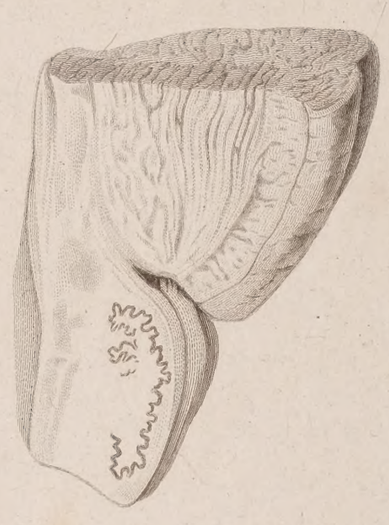

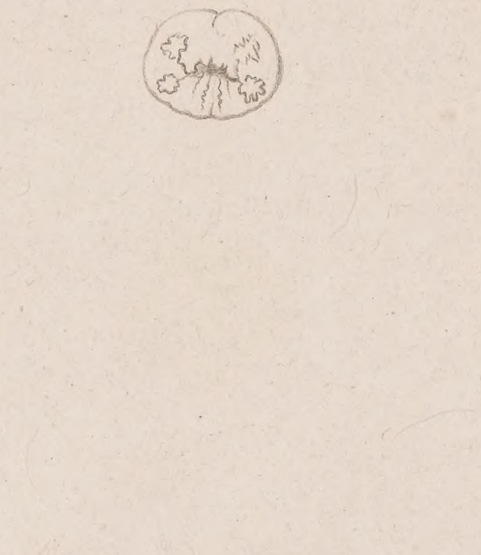

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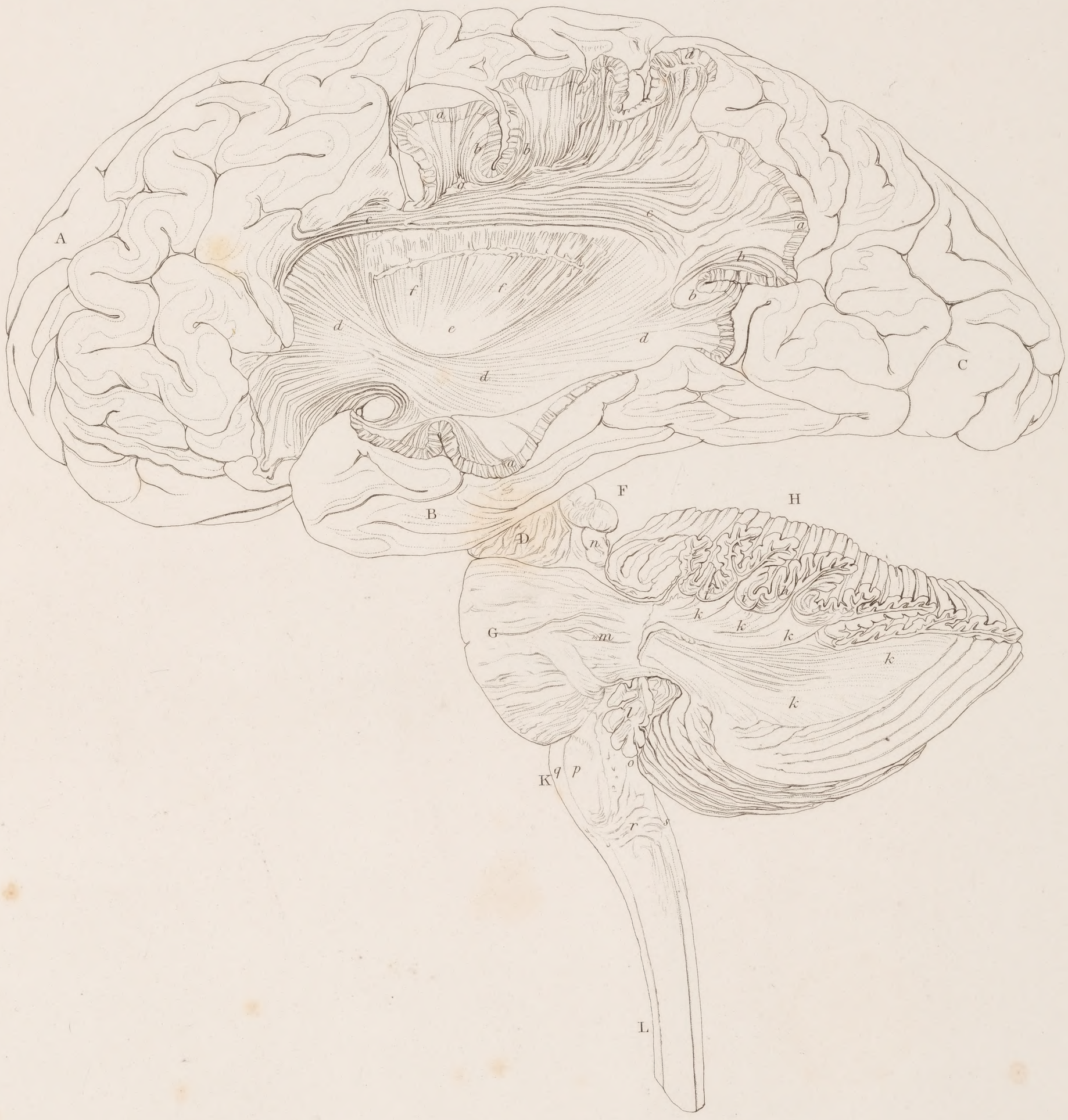

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PLATE III.

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PLATE IV.

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PLATE IV.

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PLATE V.

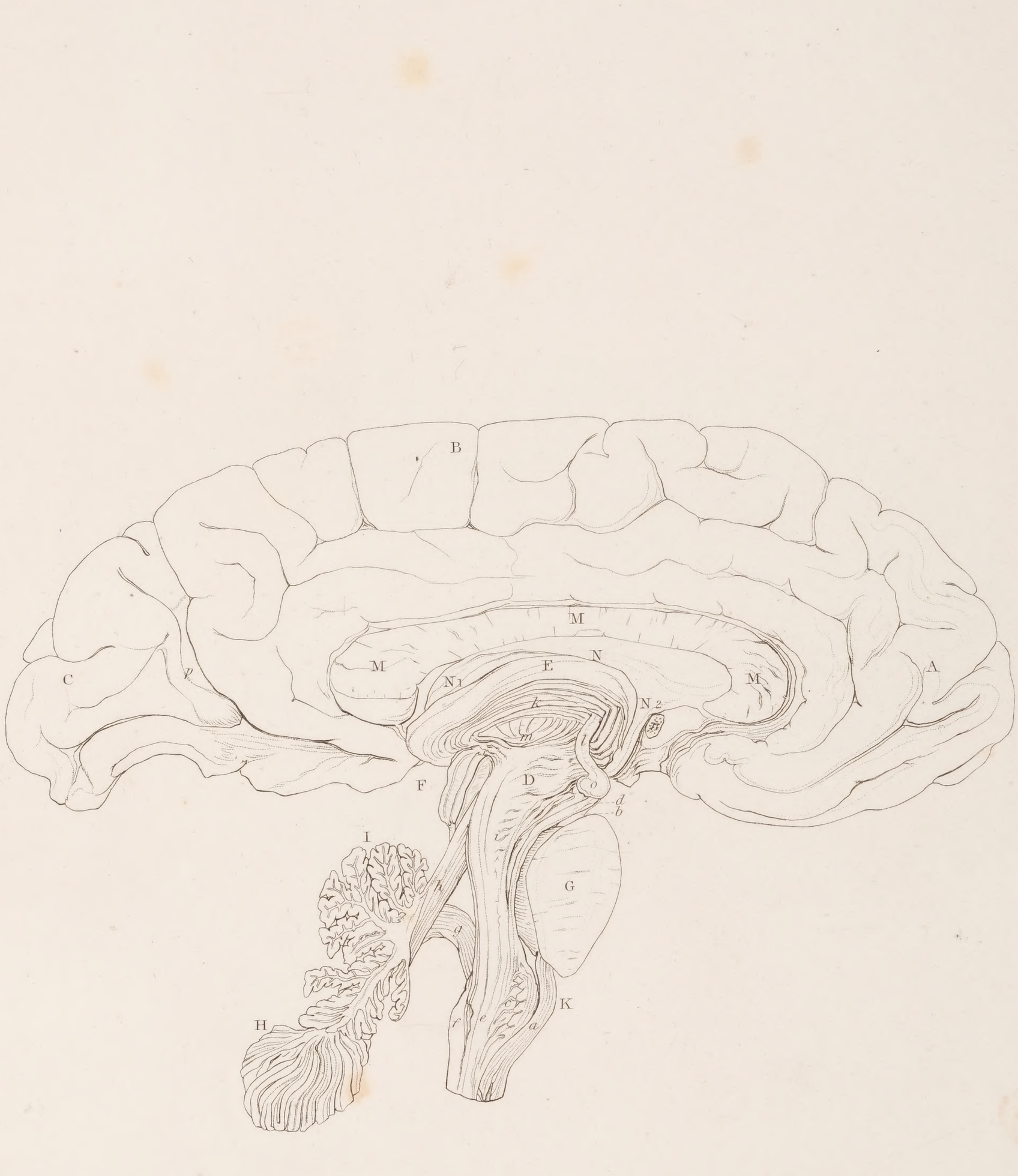

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PLATE V.

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PLATE VI.

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PLATE VI.

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